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GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

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3GPP

Postal address

3GPP support office address

650 Route des Lucioles - Sophia Antipolis
Valbonne - FRANCE
Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Internet

http://www.3gpp.org

Contents

Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present document discusses architectural issues and describes functionalities required for the Multimedia Broadcast/Multicast Service. MBMS requirements are discussed in [2] and it is the intention of this document to present one or more alternatives to achieving the required functionality within 3GPP networks.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TR 21.905: "3G Vocabulary".

[2] 3GPP TS 22.146: "Multimedia Broadcast/Multicast Service; Stage 1".

[3] IETF RFC 2710 (1999): "Multicast Listener Discovery (MLD) for IPv6"

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in [1] and the following apply.

MBMS broadcast activation: The process which enables the data reception from a specific broadcast mode MBMS on a UE.

MBMS multicast activation: The process which enables a UE to receive data from a specific MBMS multicast. Thereby the user joins a specific multicast group. The activation may be performed by the user and it may be performed inherently for subscribed multicast services.

MBMS Notification: The mechanism which informs the UEs about a forthcoming (and potentially an ongoing) data transfer from a specific MBMS service

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

IGMP Internet Group Management Protocol

MLD Multicast Listener ~~Protocol~~Discovery

MBMS Multimedia Broadcast/Multicast Service

Other abbreviations used in the present document are listed in 3GPP TR 21.905 [1].

4 Introduction

The MBMS [2] is a point-to-multipoint service in which data is transmitted from a single source entity to multiple users. Transmitting the same data to multiple users allows network resources to be shared.

The MBMS offers two modes:

- **Broadcast Mode**
- **Multicast Mode**

5 High Level Functionality

A short overview

5.1 Architecture Principles

In developing and evaluating different architectural options for MBMS, the following principles should be taken as general architectural guidelines that should be followed:

1. MBMS architecture shall enable the efficient usage of radio-network and core-network resources, with the main focus on the radio interface efficiency. Specifically, multiple users should be able to share common resources when receiving identical traffic.
2. The MBMS architecture shall support common features for MBMS multicast and broadcast modes, e.g. both modes shall preferably use the same low-layer bearer for data transport over the radio interface.
3. MBMS architecture shall support external data sources in both modes. MBMS shall support both IP multicast and IP unicast sources.
4. MBMS architecture should re-use, to the extent possible, existing 3GPP network components and protocol elements thus minimizing necessary changes to existing infrastructure and providing a solution based on well-known concepts.
5. MBMS shall be a point-to-multipoint bearer service for IP packets in the PS domain.
6. MBMS shall be interoperable with IETF IP Multicast.
7. MBMS shall support IETF IP Multicast addressing.

Note: It was not agreed and it is for further study whether MBMS shall be backwards compatible with the already specified IETF IP Multicast support in GGSN.

8. It shall be possible for UEs to receive MBMS when the terminal is attached.
9. It shall be possible for UEs to receive MBMS data in parallel to other services and ~~signaling~~signalling (e.g. paging, voice call).
10. MBMS shall support different quality of service levels. The mechanisms for this are for further study, one example is repetitions to all users.
11. MBMS service areas shall be defined per individual service with a per cell granularity.
12. MBMS is not supported in the CS domain.
13. When the UE is already receiving MBMS, it shall be possible for UE to be notified about other MBMS services.

14. Charging data shall be provided per subscriber for MBMS multicast mode .
15. The MBMS bearer service concept should contain the decision making process for selection of point-to-point or point-to-multipoint configurations.
16. The architecture should be able to provide home MBMS multicast services to users when roaming outside their home network as subject to interoperator agreements.
17. MBMS should be designed to minimise power consumption within the mobile station.
18. ~~18.~~—Applications shall be tolerant to packet loss and duplication ~~eg~~e.g. due to UE mobility or transmission loss.
19. "The backwards compatibility of the MBMS service to the R99 IP multicast delivery mechanism shall be considered. Interworking possibilities between MBMS capable network elements and non-MBMS capable network elements (e.g. interworking with R99 IP Multicast service GGSNs) shall be described.

5.2 Architectural Overview

5.3 MBMS Reference Points

Description of MBMS interaction with other entities within the network (e.g. User, VASP, Charging DB, Other?)

5.4 High Level Functions

Multimedia Broadcast/Multicast Service is associated with several logical functions that should be provided by the network.

5.4.1 Authentication and Authorization

5.4.1.1 Content provider Authentication and Authorization

- MBMS should be able to identify and authenticate the content provider prior to receiving control or data from it.
- A content provider may request to provide a multicast or broadcast service using MBMS possibly stating desired QoS, geographical areas and other service-related parameters. MBMS shall be able to authorize this service provision with the requested parameters prior to service initiation.

5.4.2 Efficient Routing and Resource Usage

- The MBMS shall be able to efficiently route multicast and broadcast over the radio interface and within the radio network. Efficient routing within the core-network is desired as well.
- In Multicast mode, MBMS should support multicast resource allocation where-by data transmission to a multicast group is carried out in certain cell only if multicast group members are to be found in that cell.

5.4.3 Mobility Management and Service Continuity

- MBMS shall support service continuity when moving from cell to cell within the multicast/broadcast area.

NOTE: Loss of data may occur during this process.

- MBMS should enable roaming users to receive both home and local multicast services. Roaming users should be able to receive local broadcast services as well.

5.4.4 Service Initiation and Termination

- The UE shall be able to enable and disable broadcast service reception.
- The UE shall be able to join and leave multicast groups. Roaming users should be able to join and leave multicast groups in the home or visited network.
- The MBMS must be able to authorize subscribers to join multicast groups (i.e. receive multicast services).

5.4.8 Charging

5.4.9 Security

- To prevent unauthorized reception of multicast data, multicast transmission may be secured.
- To prevent injection of malicious content into the network MBMS should be able to authenticate the source and verify integrity of the data received from the content provider.

5.4.10 Addressing

5.4.11 Roaming

6 Network and Protocol Architecture

Options for different network architectures together with a rough description of necessary functionality and alterations required for network elements and protocols.

6.1 MBMS Architecture

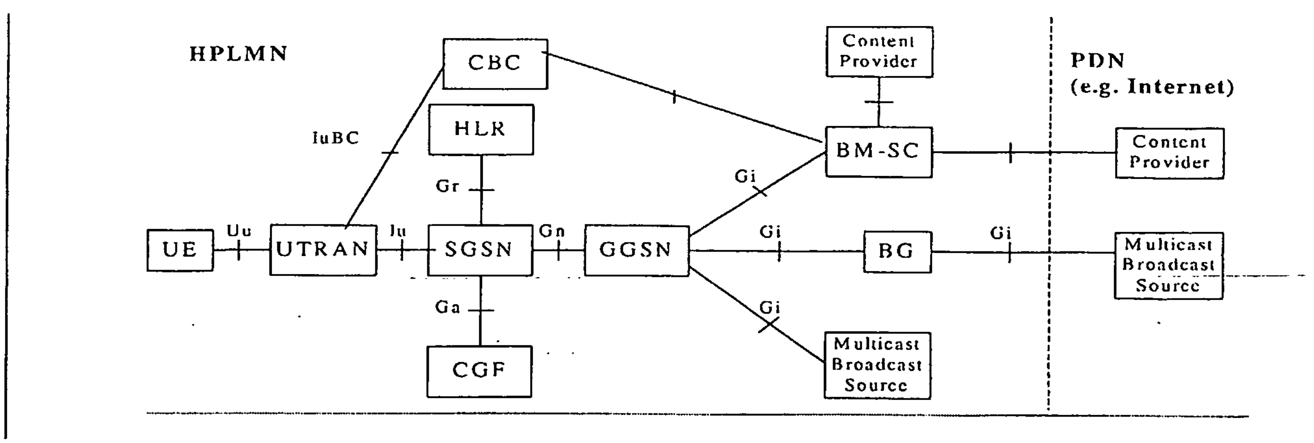


Fig. 1 MBMS Architecture

In the MBMS architecture the SGSN performs user individual service control functions and the SGSN concentrates all individual users of the same MBMS service into a single MBMS service. The SGSN maintains a single connection with the source of the MBMS data. The SGSN duplicates the packets received from the GGSN for forwarding to each RNC involved in provision of a specific MBMS service.

The GGSN terminates the MBMS GTP tunnels from the SGSN and links these tunnels via IP multicast with the MBMS data source. The GGSN duplicates the packets received from the MBMS data source for forwarding to each SGSN to which a GTP tunnel is established for a specific MBMS service.

The ~~MB~~BM-SC is an MBMS data source. MBMS data may be scheduled in the ~~MB~~BM-SC, e.g. for transmission to the user every hour. It offers interfaces over that content provider can request data delivery to users. The ~~MB-SC~~BM-SC may authorise and charge content provider.

The Cell Broadcast ~~Center~~Centre (CBC) may be used to announce MBMS services to the users. How this is accomplished is FFS.

The architecture allows for other MBMS broadcast/multicast data sources. Internal ~~data~~data sources may directly provide their data. Data delivery by external sources is controlled by Border Gateways (BG) which may allow for example data from single addresses and ports to pass into the PLMN for delivery by an MBMS service.

The architecture assumes the use of IP multicast at the reference point Gi. The MBMS data source has only one connection to the IP backbone. The reference point from the content provider to the ~~MB-SC~~BM-SC is not standardised. It might become to complex or to restrictive for service creation. For example, this may be a reference point between the ~~MB-SC~~BM-SC and an authoring system, or the authoring functionality may be distributed between both entities.

The same architecture provides MBMS broadcast services mainly by using the transport functions. The user individual SGSN functions are not required. Instead each individual broadcast service is configured in the SGSN.

Note: For the terminal split case, MBMS shall be able to interoperate with an IP multicast client software on the TE. The mechanism for this interoperability is FFS.

6.1.1 SGSN Functions

A number of functions provided by the SGSN for ptp bearer services may be used to provide MBMS:

- The SGSN authenticates users based on subscription data from HLR
- The SGSN authorises the usage of services/resources based on subscription data from HLR
- The SGSN provides user individual service control (ptp~~PtP~~ services)
- The SGSN provides user individual mobility management
- The SGSN may limit the service area per individual user
- The SGSN stores contexts per activated service per individual user
- The SGSN generates charging data per service for each user
- The SGSN provides CAMEL functions (e.g. prepaid)
- The SGSN establishes RABs on demand when data ha~~ve~~s to be transferred to the users

All these functions may be used in an MBMS architecture (potentially with modifications) for user individual control of MBMS multicast services, i.e. to activate, deactivate, authorise, ... the MBMS services for individual users. The mechanisms for provision of RABs on demand when data is to transfer may need extensions to provide shared resources for MBMS.

6.1.2 GGSN functions

The functions a GGSN could provide for MBMS are:

- Message Screening
- Charging Data Collection

- Mobility management
- Tunnelling of data
- Service (QoS) negotiation
- Policing

Message screening is not needed if the MBMS sources are internal in the PLMN or it is provided by the ~~MB-SC~~BM-SC or the BG which are gateways to external MBMS data sources.

Charging data may be collected for the MBMS data sources. But, the potential existing sources like ESS or MMS provide charging information and very likely also the ~~MB-SC~~BM-SC. User individual charging information is collected by the SGSN. It is not favourable to keep user individual contexts per multicast service in the SGSN and in the GGSN in parallel under the assumption that such user individual contexts are stored as long as the user is attached.

The mobility management of the GGSN can not support MBMS as the GTP tunnels would be fixed. These tunnels are used by multiple UEs in parallel an can not move with UEs.

The tunnelling seems the most important GGSN function for MBMS. It allows the provision of HPLMN MBMS multicast services to users roaming in a VPLMN. The tunnelling separates the traffic of the different MBMS services from each other and allows therefore the use of the same addresses in HPLMN and VPLMN. A co-ordination of addresses between different PLMNs is not needed.

A GGSN could simplify O&M when used to provide the parameters for the individual MBMS services at the service negotiation when the GTP tunnels are established. This approach has limitation when different configurations are required for the same service (potentially one SGSN has to provide different MBMS data for the same service in different areas, e.g. regional news). Then it has to be configured differently on the SGSN. Also the broadcast service needs to be configured on the SGSN, as there is no signalling with UEs which could trigger a tunnel establishment between SGSN and GGSN.

The GGSN could police the traffic of the individual MBMS services. But, most MBMS data sources are allocated within the PLMN and therefore under control of the operator. In addition, the QoS profile is very likely configured on the SGSN. And, the RAB will limit the possible throughput to the maximum bitrate and inherently police the traffic.

Most of the GGSN functions described above do not add any functionality useful for MBMS. Only for provision of HPLMN MBMS services to roaming users a GGSN is added to the architecture. The same approach is used for provision of MBMS services within one PLMN to avoid two different architectures.

6.1.3 UTRAN Functionality

6.1.3.1 Broadcast Mode

6.1.3.2 Multicast Mode

The UTRAN shall provide the following functionality for efficient support of MBMS

- responsible for establishment of point to multipoint or point to point channels on the air interface to support MBMS.
- capable of routing MBMS traffic over either a point to multipoint channel or over a point to point channel.
- capable of discovering the number of MBMS users within a cell
- makes the decision to select channel type (point to multipoint or point to point) based on the number of users within a cell receiving MBMS service. The threshold value for this is operator defined

6.1.4 Other MBMS functions

Besides the user individual service control functions comparable to the functions already provided by an SGSN or GGSN there are some additional functions required for MBMS, mainly the specific data transport. It is assumed, that the SGSN performs the user individual service control, generates the charging data per user and establishes the RABs when MBMS data is to transfer. The SGSN concentrates all user individual services into one MBMS service for each specific MBMS service. This includes the establishment of a number of RABs to transfer MBMS data to the radio network entities of the related service area and it includes a single connection between the SGSN and the GGSN for each individual MBMS service. The SGSN duplicates the data received from the GGSN for each RAB established for the service. Similarly, the GGSN duplicates data received from the MBMS source for each GTP tunnel related to the same MBMS service.

6.1.5 MBMS Context

The entities of the PLMN that provide MBMS services maintain one or more MBMS contexts for each active MBMS service. An MBMS context contains information and parameters necessary for each MBMS service. An MBMS context contains among others the PDP address, which is the IP address of the MBMS service (IP Multicast address), and the APN used to access the MBMS service. The combination of the PDP address and the APN uniquely identify the MBMS service. Other content of the MBMS context is FFS. It is FFS whether PLMN entities maintain service specific MBMS contexts per UE, per network entity, or both.

6.1.6 SM-SC functions

The ~~MB-SC~~BM-SC is an MBMS data source. MBMS data may be scheduled in the ~~MB-SC~~BM-SC, e.g. for transmission to the user every hour. It offers interfaces to content providers who can request data delivery to users. The ~~MB-SC~~BM-SC may authorise and charge content provider. It may offer authoring tools for content creation. It is FFS whether the ~~MB-SC~~BM-SC relays traffic from other MBMS sources, so that the ~~MB-SC~~BM-SC is the only source of MBMS data. The SM-SC may integrate the MBMS specific GGSN functions. Then, the GTP tunnel from the SGSN terminate at the ~~MB-SC~~BM-SC.

6.1.7 CBC functions

The Cell Broadcast ~~Center~~Centre (CBC) may be used to announce MBMS services to the users. The functions a CBC could provide for MBMS service announcement are FFS.

6.2 <Architecture Option 2 Label>

7 Functions and Procedures

7.1 MBMS Data Transfer in the Core Network

Multicast data must be available at the RNCs to be sent over the radio. The options for the data path are to send multicast data from a multicast "source" (could be a multicast server or multicast capable node) to:

- all RNCs~~;~~
- only to selected RNCs which have multicast users,
- to the all SGSNs to be further distributed by the SGSN to the RNCs, or
- to selected SGSNs which have multicast users to be further distributed by the SGSN to the RNCs, or

- to selected GGSN which support multicast service (possibly identified using APNs) and to be further distributed from the GGSN towards the RNCs.

The first option is wasteful of network resources and also makes it difficult to send data to VPLMNs for roaming users. The second option, an optimisation of the first one, is to send data only to RNCs with multicast users within the PLMN under control of the activation centre but this cannot support roaming users either. Handling user mobility is also an issue here if for example the UE is in PMM idle.

Sending data to the GGSN in the last option is a good choice to support roaming users. The data is then multicast to the SGSNs with registered multicast users. Sending data through the SGSN – either directly (the third option) or via the GGSN (the last option) – has advantages since the SGSN is aware of the user location information even in PMM idle state but the use of Iu-flex introduces complexities.

A combination of the above listed options can also be used – with direct transfer to RNC for the home users and via the GGSN to the roaming user.

The protocol to use to send data to the RNC or SGSN (if they are the recipient NE as per options discussed above) could be GTP or using IP multicast. Using IP multicast would be more efficient over the transport network if it supports multicast routers

Where the option to optimise and send data only to selected NEs is chosen, a signalling mechanism must be used to identify the appropriate nodes to set up the data path. If the data path is through the SGSN and GGSN, signalling similar to the existing GTP-C can be used to set up the tunnels. If IP multicast is used, the NEs wanting to receive multicast data, such as RNC or GGSN that have multicast users, could indicate its inclusion using IGMP/MLD.

The selection of an option is FFS.

7.1.1 Intra Domain Connection of RAN Nodes to Multiple CN Nodes (Iu-Flex)

Iu-flex brings some complications to the multicast architecture. Iu-flex allows users on the same RNC to be registered in different SGSNs. Hence following the normal method of user plane using the same SGSN as the user is registered in could result in multiple streams to the RNC.

Whenever a GTP tunnel has to be set up between the RNC and the CN for multicast bearers, (either due to relocation or service initiation), and Iu Flex is configured in the network then the following options are available to reduce the impact on the network resource usage

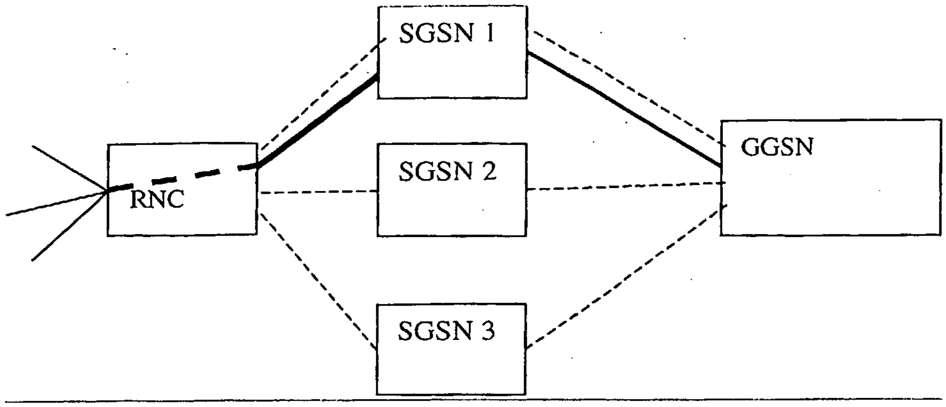
Options are:

- Use of a Default SGSN
- Permitting multiple streams to RNC
- Bypassing SGSN
- RNC initiates only required number of RABs

Option 1: Default SGSN

1. As a result of activation or relocation, the RNC has to decide whether a multicast stream has to be established for that user or whether he can be added to an existing stream (this is assuming the network is using a point to multipoint link).
2. In order to ensure only one source of data to the RNC, the RNC has to have a known "default SGSN", which it uses to establish a pre-configured path for the multicast stream.
3. A control RAB will be established between the RNC and the SGSN the user is registered in.
4. Volume based charging will be restricted.

In this option, SGSN 1 is the "default SGSN". Only one RAB is established across the Iu interface.

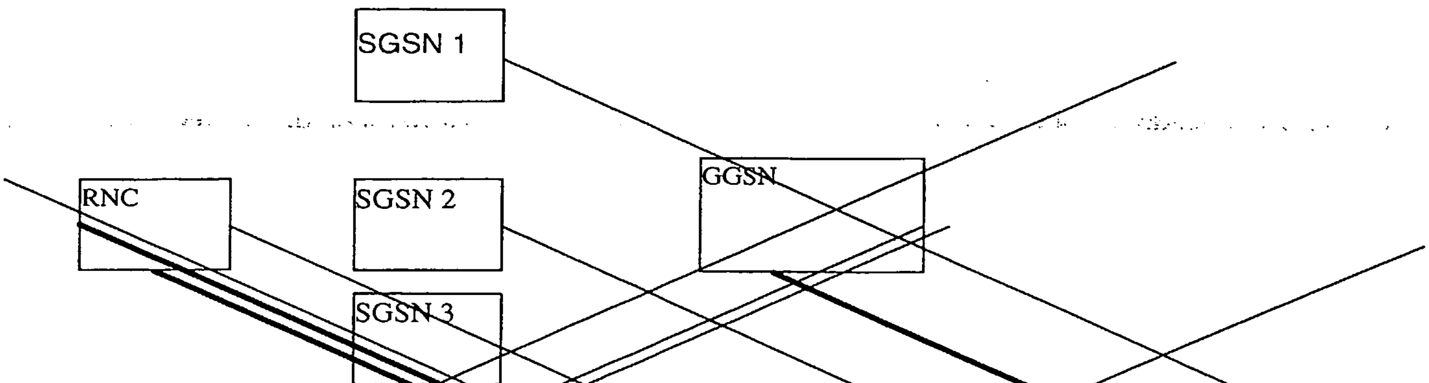

SGSN 1
RNC
SGSN 2
GGSN
SGSN 3

Option 2 "SGSN Bypass"

This option would require GTP tunnel establishment and release for the user plane between the GGSN and RNC, without the SGSN being involved. Control plane information remains via the SGSN. Removing the SGSN from the data path would remove the inter-operator exposure available between SGSN and GGSN for roaming. Volume based charging would be restricted.

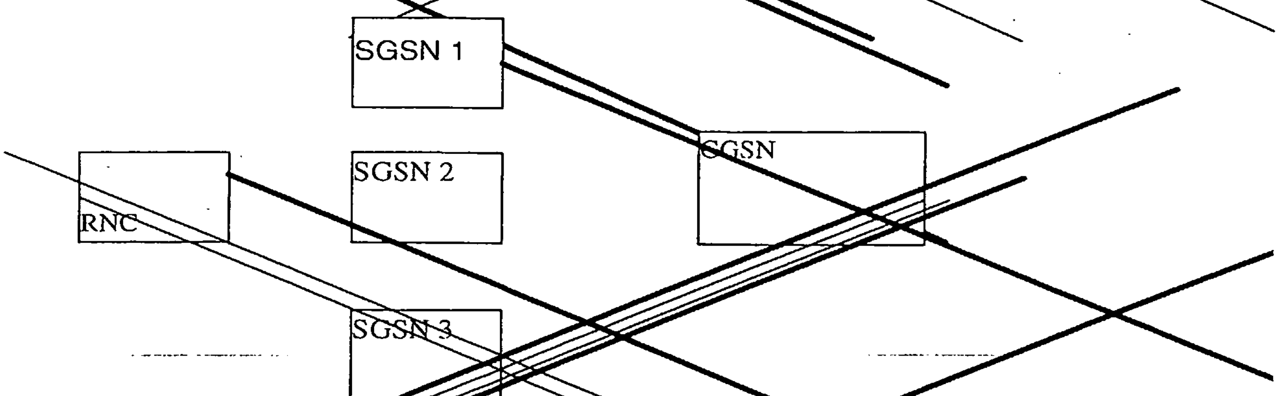
~~Signaling~~Signalling

Data path



Option 3 RNC decides on the Multicast Stream

In this option, the RNC is permitted to receive multiple streams. It then decides to take only one of the streams.



Option 4 "RNC initiates only required number of RABs"

5. When the data transfer starts for an MBMS multicast the RNC detects that multiple SGSN send notifications to establish the same service. The RNC establishes the multicast RAB with only one SGSN. The other SGSNs establish no RABs for the MBMS multicast. But, the other SGSN receive the MBMS multicast data from the GGSN and generate volume charging information for the attached UEs.

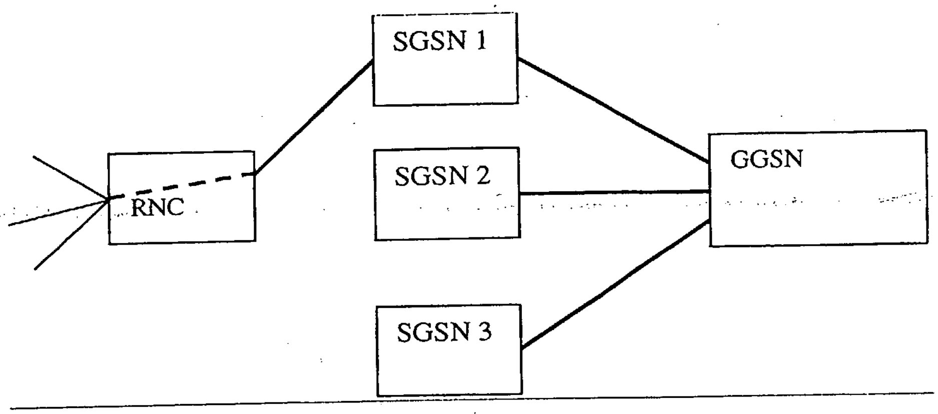
6. If IU-Flex is employed, it is possible for users within a multicast group to be served by the same RNC but different SGSN. In this situation some of the MBMS IE must be the same even though different SGSNs may be involved.

It is FFS how this is done but the following solutions could be considered :

a) These IE can be assigned by the same network element

b) A consistent rule is applied unlike the random generation as used in the TMSI

c) Synchronization between different SGSNs.



7.2 Packet Temporary Mobile Group Identity in MBMS

In order to avoid congestion of the paging channels (at least in GSM), one solution is to allocate one common identity to all members of each multicast group, which are served by the same SGSN. This Temporary Mobile Group Identity (TMGI) could be allocated during a Routing Area Update, a GPRS Attach or a P-TMSI Reallocation procedure before the MBMS data transfer (e.g. the first TMGI allocation might occur when the mobile joins the IP multicast group). Separate multicast groups have different TMGIs. TMGIs may also be used to notify users of broadcast transmissions. It is FFS whether the same TMGIs can be used in more than one SGSN.

7.3 Decision process for selection of point-to-point or point-to-multipoint configuration

7.3.1 Multicast Mode

To ensure that radio resources are not wasted, the radio network needs to estimate the number of users in a cell in order to determine whether to establish a point to multipoint channel in that cell or point to point channels to each user.

In the event of the number of users within a cell exceeding an operator defined threshold, the radio network will establish a point to multipoint channel in that cell.

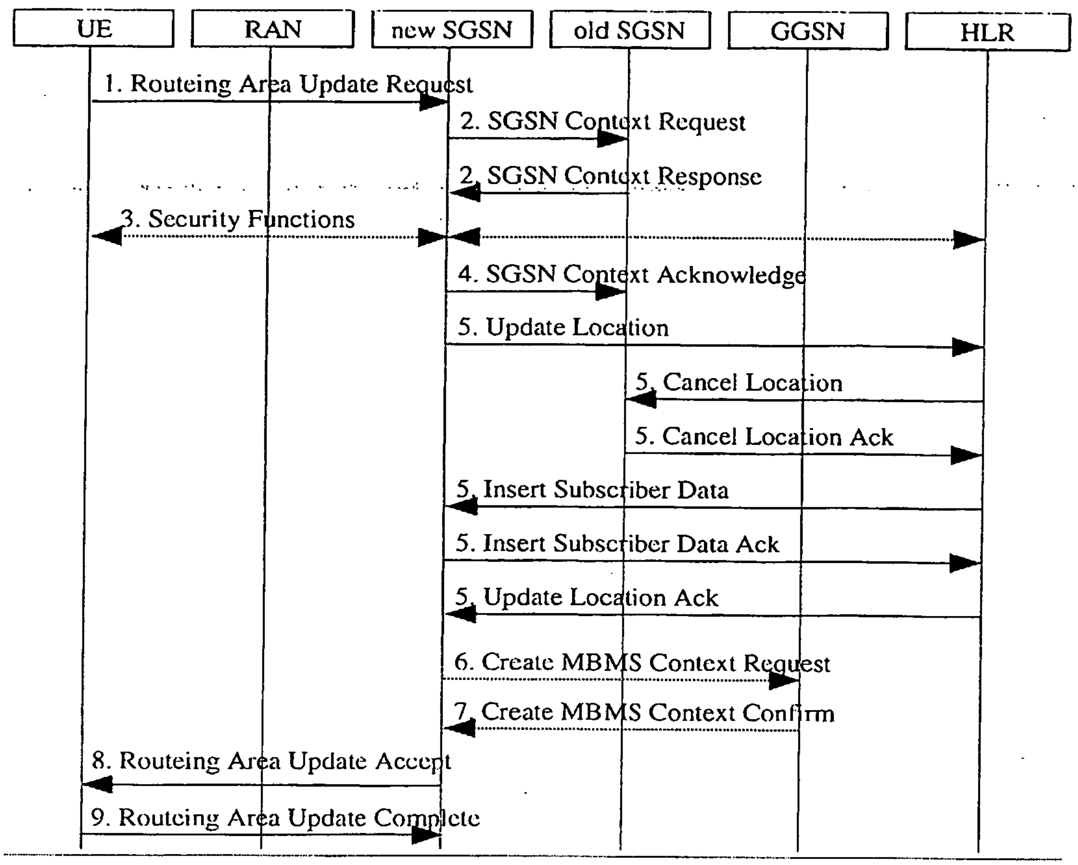
If a point to multipoint channel has been established and the number of users drops below an operator defined value then the radio network may be required to drop back to point to point channels.

Note: The two thresholds may be different.

It is FFS whether this change of channel can occur whilst data is being broadcast/multicast.

7.4 MBMS SGSN change procedure

This procedure is performed when a UE in GMM IDLE changes the SGSN, i.e. there are no RABs and no signalling connections with the SGSN. The RABs for MBMS services are not exclusive for individual UEs. A signalling connection for an UE with MBMS services only is not intended as this is against the multicast concept. UEs which have only active MBMS services are therefore in GMM IDLE. These UEs perform the Routeing Area update with MBMS extensions as described below. The procedure is performed regardless whether MBMS data transfer is ongoing or not. The handling of potential ptp~~PtP~~ PDP contexts is not affected. The described procedure shows not all details of the Routeing Area update procedure. The MBMS specific additions to the Routeing Area update procedure are in bold.



Mobility between SGSNs

1. The UE moves from the service area of the old SGSN to the service area of the new SGSN. The UE sends a Routeing Area Update Request to the new SGSN. The RAN shall add an identity of the area where the message was received before passing the message to the SGSN.

2. The new SGSN sends SGSN Context Request to the old SGSN to get the MM, the PDP and **the MBMS contexts** for the UE. The old SGSN sends all UE contexts with the SGSN Context Response to the new SGSN.

3. Security functions may be executed, e.g. authenticating the UE.

4. The new SGSN sends an SGSN Context Acknowledge message to the old SGSN to indicate that is has taken over the control for that UE.

5. All procedures to provide the subscription and security data in the new SGSN and to register the new SGSN at the HLR are performed.

6. The new SGSN validates the UE's presence. If due to roaming restrictions the UE is not allowed to be attached in the SGSN, or if subscription checking fails, the new SGSN rejects the routeing area

update with an appropriate cause. If all checks are successful, the new SGSN constructs MM, PDP **and MBMS** contexts for the UE. **The new SGSN checks each individual MBMS service indicated by the MBMS contexts of the UE. If it is the first UE with this specific MBMS multicast service on this SGSN the SGSN requests the creation of an MBMS context on the GGSN and the establishment of a GTP tunnel between the SGSN and the GGSN.**

7. **The GGSN confirms the establishment of the MBMS context if performed according to step 6).**

8. The new SGSN responds to the UE with Routeing Area Update Accept. **One or more TMGI may be allocated to the UE for MBMS.**

9. The UE acknowledges the new parameters by returning a Routeing Area Update Complete.

7.5 MBMS relocation and handover

This procedure is performed when a UE in GMM CONNECTED changes the SGSN, i.e. there is a signalling connections with the SGSN. The RABs of ptp~~PtP~~ services are transferred by relocation/handover. MBMS RABs are not exclusive for individual UEs. Active MBMS services of the UE are transferred to the new SGSN by the context transfer which is embedded in the relocation/handover procedures. The procedure is performed regardless whether MBMS data transfer is ongoing or not. The described procedure shows not all details of the relocation procedure. Only the relocation procedure is described. The handover procedure has similar extensions for MBMS. The MBMS specific additions to the relocation procedure are in bold.

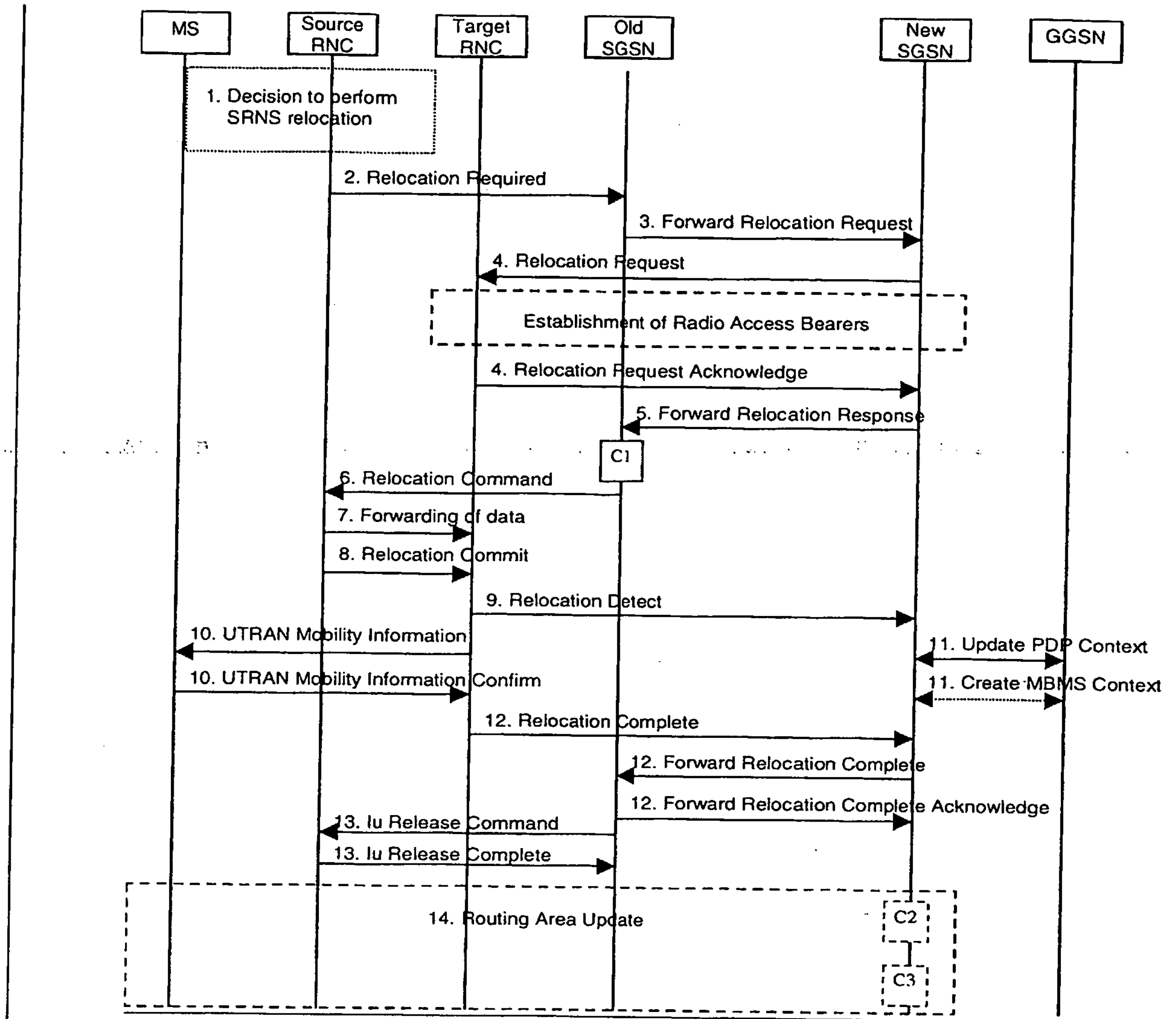


Figure 1~~1~~: SRNS Relocation Procedure

1) The source SRNC decides to perform/initiate SRNS relocation.

2) The source SRNC sends a Relocation Required message (Relocation Type, Cause, Source ID, Target ID, Source RNC to target RNC transparent container) to the old SGSN. The source SRNC shall set the Relocation Type to "UE not involved". The Source SRNC to Target RNC Transparent Container includes the necessary information for Relocation co-ordination, security functionality and RRC protocol context information (including MS Capabilities).

3) The old SGSN determines from the Target ID if the SRNS Relocation is an intra-SGSN SRNS relocation or an inter-SGSN SRNS relocation. In case of inter-SGSN SRNS relocation, the old SGSN initiates the relocation resource allocation procedure by sending a Forward Relocation Request message (IMSI, Tunnel Endpoint Identifier Signalling, MM Context, PDP Context, **MBMS context,** Target Identification, UTRAN transparent container, RANAP Cause) to the new SGSN. The Forward Relocation Request message is applicable only in the case of inter-SGSN SRNS relocation.

4) The new SGSN sends a Relocation Request message (Permanent NAS UE Identity, Cause, CN Domain Indicator, Source-RNC to target RNC transparent container, RABs to be setup) to the target RNC. Only the Iu Bearers of the RABs are setup between the target RNC and the new-SGSN as the existing Radio Bearers will be reallocated between the MS and the target RNC when the target RNC takes the role of the serving RNC.

5) When resources for the transmission of user data between the target RNC and the new SGSN have been allocated and the new SGSN is ready for relocation of SRNS, the Forward Relocation Response message (Cause, RANAP Cause, and RAB Setup Information) is sent from the new SGSN to old SGSN. This message indicates that the target RNC is ready to receive from source SRNC the forwarded downlink PDUs, i.e. the relocation resource allocation procedure is terminated successfully. The Forward Relocation Response message is applicable only in case of inter-SGSN SRNS relocation.

6) The old SGSN continues the relocation of SRNS by sending a Relocation Command message (RABs to be released, and RABs subject to data forwarding) to the source SRNC. The old SGSN decides the RABs to be subject for data forwarding based on QoS, and those RABs shall be contained in RABs subject to data forwarding.

7) The source SRNC may, according to the QoS profile, begin the forwarding of data for the RABs to be subject for data forwarding.

8) Before sending the Relocation Commit the uplink and downlink data transfer in the source, SRNC shall be suspended for RABs, which require delivery order. The source RNC shall start the data-forwarding timer. When the source SRNC is ready, the source SRNC shall trigger the execution of relocation of SRNS by sending a Relocation Commit message (SRNS Contexts) to the target RNC over the Iur interface.

9) The target RNC shall send a Relocation Detect message to the new SGSN when the relocation execution trigger is received. For SRNS relocation type "UE not involved", the relocation execution trigger is the reception of the Relocation Commit message from the Iur interface. When the Relocation Detect message is sent, the target RNC shall start SRNC operation.

10) The target SRNC sends a UTRAN Mobility Information message. This message contains UE information elements and CN information elements. The UE information elements include among others new SRNC identity and S-RNTI. The CN information elements contain among others Location Area Identification and Routeing Area Identification. The procedure shall be co-ordinated in all Iu signalling connections existing for the MS.

11) Upon receipt of the Relocation Detect message, the CN may switch the user plane from source RNC to target SRNC. If the SRNS Relocation is an inter SGSN SRNS relocation, the new SGSN sends Update PDP Context Request messages to the GGSNs concerned. The GGSNs update their PDP context fields and return an Update PDP Context Response. **If the SRNS Relocation is an inter SGSN SRNS relocation, the new SGSN checks each individual MBMS service indicated by the MBMS contexts of the UE. If it is the first UE with this specific MBMS multicast service on this SGSN the SGSN requests the creation of an MBMS context on the GGSN and the establishment of a GTP tunnel between the SGSN and the GGSN.**

12) When the target SRNC receives the UTRAN Mobility Information Confirm message, i.e. the new SRNC—ID + S-RNTI are successfully exchanged with the MS by the radio protocols, the target SRNC shall initiate the Relocation Complete procedure by sending the Relocation Complete message to the new SGSN. The purpose of the Relocation Complete procedure is to indicate by the target SRNC the completion of the relocation of the SRNS to the CN.

13) Upon receiving the Relocation Complete message or if it is an inter-SGSN SRNS relocation; the Forward Relocation Complete message, the old SGSN sends an Iu Release Command message to the source RNC. When the RNC data-forwarding timer has expired the source RNC responds with an Iu Release Complete.

14) After the MS has finished the RNTI reallocation procedure and if the new Routeing Area Identification is different from the old one, the MS initiates the Routeing Area Update procedure. See subclause "Location Management Procedures (Iu mode only)". Note that it is only a subset of the RA update procedure that is performed, since the MS is in PMM-CONNECTED mode. **New TMGI(s) may be allocated to the UE for MBMS services.**

8 Information Flows

8.1 Service Discovery, initiation and Termination

8.1.1 Service Announcement/Discovery

MBMS service announcement/discovery mechanisms should allow users to request or be informed about the range of MBMS services available. This includes operator specific MBMS services as well as services from content providers outside of the PLMN.

Operators/service providers may consider several service discovery mechanisms. This could include standard mechanisms such as SMS, or depending on the capability of the terminal, applications that encourage user interrogation. The method chosen to inform users about MBMS services may have to account for the users location, (e.g. current cell, in the HPLMN or VPLMN). Users who have not already subscribed to a MBMS service should also be able to discover MBMS services.

The following could be considered useful for MBMS service discovery mechanisms (not exhaustive): -

- SMS -CB
- MBMS Broadcast mode to advertise MBMS Multicast Services
- PUSH mechanism (WAP, SMS-PP)
- Web URL

8.2 Service Continuity and Mobility

8.3 Interfaces to External Media Sources

8.4 Roaming

8.5 Security

8.6 Charging

9 Interaction with CS/PS services

10 Information Storage

Annex A

This section contains text for information

Decision process for selection of point-to-point or point-to-multipoint configuration

For GSM, one way to achieve this would be for the paging messages which carry the TMGI to also specify the value to be included by the mobile into any subsequent (Packet) Channel Request message. After receiving a page with their TMGI, each mobile sends one (Packet) Channel Request message with the value specified in the page message. The BSS then counts the number of (Packet) Channel Request messages containing the specified contents received in each cell. This method seems likely to give an accurate measure of either (a) how many mobiles belonging to that group are in the cell (if there are less than, say, 10 mobiles in the cell), or (b) whether there are more than, say, 10 mobiles belonging to that group in the cell.

For UMTS: the method is FFS

Annex B: Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
22/01/02				0.1.0	Output version from TSG SA2#22		
15/03/02				0.2.0	Output version from TSG SA2#23 taking into account S2-020410, S2-020412, S2-020583Rev1~~2~~, S2-020584, S2-020598Rev1, S2-020769Rev1, S2-020771, S2-020772, S2-020773, S2-020774,S2-020775, S2-020800rev2, S2-020801		
02/04/02				0.3.0	Corrections to V 0.2.0 after email comments on reflector including addition of S2-020525		